

CLAIMS

What is claimed is:

1. A system for detecting tissue contact and penetration depth comprising:
a needle with a first end and a second end, said needle having a lumen and at least one aperture located a predetermined distance from said first end;
a fluid pressure measurement assembly coupled with a portion of said needle to measure pressure of a fluid dispensed in said needle, said pressure measurement assembly measuring a first pressure with said fluid dispensed in said needle, a second pressure when said needle contacts tissue and occludes said lumen before said aperture becomes occluded and a third pressure as said needle penetrates tissue and said aperture becomes occluded.
2. The system of claim 1 wherein said pressure measurement assembly comprising:
a fluid pressure sensor.
3. The system of claim 1 wherein said pressure of fluid includes a pressure of a therapeutic agent to be injected into said tissue.
4. The system of claim 1 wherein said pressure of fluid is a static pressure.
5. The system of claim 1 wherein said aperture has an area in said range between about 0.003 and 10 mm².

6. The system of claim 1 wherein said predetermined distance is a desired penetration depth of said needle into said tissue.
7. The system of claim 5 wherein said predetermined distance from said first end is about 0.5 to 10 millimeters.
8. The system of claim 1 wherein said first end of said needle has at least one of a tapered and untapered portion.
9. The system of claim 1 wherein said needle has an outer diameter in said range between about 0.008 and 0.26 inches.
10. The system of claim 1 wherein said needle has an inner diameter in said range between about 0.004 and 0.22 inches.
11. The system of claim 1 further comprises a computer processor coupling to said fluid pressure measurement assembly, said computer processor configured to perform at least one of determining and distinguishing said rate of changes in said static pressure to determine and distinguish said various penetration depths of said needle.

12. The system of claim 11 wherein said computer processor further couples to at least one of a visual feedback system indicator and an audible feedback system to issue human-recognizable signals as to penetration depths of said needle.

13. A method of detecting tissue contact and a needle penetration depth of a needle used internally to deliver a therapeutic agent to a patient comprising:

- filling a needle with a therapeutic agent;
- measuring a pressure of said therapeutic agent in said needle;
- measuring a first change in pressure when said needle contacts tissue at a needle tip lumen; and
- measuring a second change in pressure when said needle penetrates said tissue and occludes an aperture located a predetermined distance from said needle tip.

14. The method of claim 13 further comprises indicating said first change in said pressure and said second change in said pressure using at least one of a visual feedback scheme and an audible feedback scheme.

15. The method of claim 13 wherein measuring pressure of said therapeutic agent in said needle includes measuring pressure of said therapeutic agent using a fluid pressure measurement assembly.

16. The method of claim 13 wherein measuring said pressure of said therapeutic agent in said needle includes measuring a static fluid pressure of said therapeutic agent using a pressure measurement assembly.

17. The method of claim 13 wherein said therapeutic agent is one of a drug, growth factor, and gene therapy.

18. The method of claim 13 wherein said predetermined depth ranges between 0.5 and 10 millimeters.

19. The method of claim 14 wherein indicating said first change in pressure includes an indication to alert that said needle contacts said tissue and indicating said second change in pressure includes an indication to alert that said needle penetrates said tissue said predetermined distance.

20. The method of claim 12 wherein a computer processor coupling to a pressure measurement assembly determines rate of changes in said pressure to aid in measuring said pressure of said therapeutic agent in said needle, measuring said first change in pressure when said needle contacts tissue at a needle tip lumen, and measuring said second change in pressure when said needle penetrates said tissue and occludes said aperture located said predetermined distance from said needle tip.